

REMARKS

In the Office Action mailed March 18, 2004,

- Claim 1 was rejected under 35 U.S.C. 102(b) as being anticipated by Moshfeghi (U.S. Patent No. 5,633,951);
- Claim 11 was rejected under 35 U.S.C. 103(a) as being unpatentable over Moshfeghi; and
- Claims 2-10 and 12-20 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Allowable Subject Matter

The Examiner, in the office action, indicated that claims 2-9 and 12-19 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant, accordingly, has rewritten claims 2 and 12 as independent claims including all the limitations of their respective base claims 1 and 11. Therefore, claims 2 and 12 as rewritten and their respective dependent claims 3-9 and 13-19 are considered in condition for allowance.

Claim Rejections under 35 U.S.C. 102(b) and 103(a)

Claim 1 recites in pertinent part a method for registering images that comprises the steps of "...globally transforming one of [a first and second] images via a rigid transformation technique and locally transforming one of [the first and second] images via an iterative motion tracking technique ...". In particular, the global transformation step eliminates the global variations between the two images and provides a reliable starting point for subsequent processes including the local transformation step.

Due to intrinsic differences between the two images, the global transformation step typically cannot achieve the degree of local accuracy desired. The local transformation step, based upon the global transformation result, conducts an iterative process for each feature point identified in one of the two images to remove the minor local variations between the two images. In other words, the global transformation step and the iterative local transformation step are two distinct steps, and the former step is not part of the latter step, nor is the latter step part of the former step. The only relationship between the two steps is that the output of the former step is the input of the latter one.

The rigid transformation technique recited in claim 1 assumes that the first and second images correspond to two rigid bodies. It is well understood by one skilled in the art that the term “rigid” means that the body cannot endure any kind of deformation, be it elastic or inelastic. As a result, the movement of a rigid body consists of only two basic forms, translation and rotation, neither of which causes any relative movement between two distinct points in the rigid body. In the context of image processing and computer graphics, the rigid transformation technique also includes scaling, which actually represents a visualization effect. Fig. 5 of the present application illustrates one embodiment of the rigid transformation technique, i.e., a six-degree global similarity transformation, which employs scaling, rotation and translation to account for the global variations between the two images.

In contrast, as shown in Fig. 2 of the ‘951 patent, the Moshfeghi method is a single iterative process that iteratively reduces the elastic stiffness of volume 2 until it can be registered with volume 1. This method does not include a separate global transformation step distinct from an iterative local transformation step as recited in applicant’s claim 1. In particular, the surface matching process block 38 that the Examiner equates at paragraph 3 of the Office Action to the applicant’s global transformation step is actually an inseparable component of this iterative process. If this surface matching process is treated as a global transformation step, the Moshfeghi method has to conduct the global transformation multiple times, once per iteration, which is clearly different from the recitation of claim 1.

The Moshfeghi method, moreover, teaches that the surface matching process block 38 is a 3-D elastic method that determines a virtual force field to distort (or warp) one surface shape associated with one image to that of the other. *See* column 7, line 51-58 of Moshfeghi. In other words, this force field causes an elastic deformation to the surface shape, which is categorically different from a rigid transformation. Therefore, the elastic surface matching method of Moshfeghi is not equivalent to applicant’s step of globally transforming an image via a rigid transformation technique as recited by claim 1.

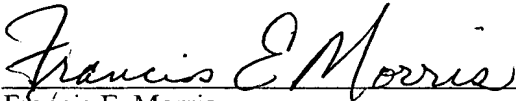
Since Moshfeghi does not teach a global transformation step using a rigid transformation technique, claim 1 and its dependent claim 10 are not anticipated by Moshfeghi.

Claim 11 is a computer program product claim that is substantially similar to claim 1. Therefore, claim 11 and its dependent claim 20 are also patentable over Moshfeghi.

In light of the above amendments and remarks, Applicant respectfully requests that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned at (650) 849-7777 if a telephone call could help resolve any remaining items.

Respectfully submitted,

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